tineæ, there is a repetition of the same phenomenon which has been previously described in the series of forms of the Gelidieæ and Cryptonemieæ, namely, that in certain forms the ramified ooblastema-filaments produce spores directly from their cells; whilst in others these individual cells enter into connexion with the cells of the surrounding sterile thallus-tissue, and thus the formation of multicellular complexes of spores is superinduced*.

[To be continued.]

II.—*Note on the Structure of the Skeleton in the Genera* Corallium, Tubipora, *and* Syringopora. By H. Alleyne Nicholson, M.D., D.Sc., Regius Professor of Natural History in the University of Aberdeen.

Some time ago I published a short paper on the structure of the skeleton in *Tubipora*, with special reference to the relations of this genus to the Palæozoic *Syringopora* (Proc. Roy. Soc. Edinb. 1880–81, p. 219). The general conclusion to which I was led by a comparison between these two types was that, though undoubtedly similar in aspect, they were not really related to one another. The grounds upon which I based this conclusion were the following :—

(1) "In the first place, there is the very important and remarkable difference in the minute structure of the calcareous skeleton in the two types in question. In *Tubipora* the corallum is made up of fused † calcareous spicules, which are so disposed as to give rise to a universally distributed system of minute canaliculi or tubuli, which open on both the outer and inner surfaces of the skeleton by well-marked apertures. The size of these tubuli is comparatively so great that it is quite impossible that their presence could be overlooked in thin sections of *Syringopora*, if they really existed in this genus. On the other hand, the skeleton of *Syringopora*, as

* I have hitherto found among the Gigartineæ nothing analogous to the third case, namely, that the cells of the ooblastema-filaments conjugate with individual cells of the thallus, and then these thallus-cells develop into multicellular spore-complexes.

† Mr. Hickson has rightly pointed out that the term "fused" as applied to the spicules of *Tubipora* might lead to some misconception, as actual amalgamation of the spicules does not take place. The spicules, on the other hand, are united with one another closely by their sides or projecting points, and it was to indicate this union only that I employed the term "fused" in my former paper.

regards its minute structure, is quite compact, and shows no signs whatever either of being penetrated by a system of tubuli or of being formed by the fusion of ectodermal spicules."

(2) Secondly, I was not able to recognize in *Tubipora* any thing which appeared to me to be truly of the nature of "tabulæ;" nor did I regard the "axial tube" of *Tubipora* as truly homologous with the funnel-shaped tabulæ of *Syringopora.*

(3) I pointed out that the corallites in *Syringopora* are provided with a well-developed system of septal spines, which are extremely similar to the septal spines of various species of *Favosites* and *Porites,* whereas I had been unable to detect similar septal spines in the corallites of *Tubipora.*

Recently an elaborate paper has been published by Mr. Sydney J. Hickson "On the Structure and Relations of *Tubipora*" (Quart. Journ. Micr. Sci., Oct. 1883). In this memoir Mr. Hickson comes to the conclusion that the genus *Tubipora* is, after all, closely allied to *Syringopora*, and that the latter is really an Alcyonarian, the Favositidæ also being referable to the Alcyonaria. In formulating this conclusion, Mr. Hickson passes in review the three points mentioned above which had led me to believe that *Syringopora* and *Tubipora* were not really related to one another; and I should wish, therefore, to make one or two remarks on each of these points.

In the first place, as to the wide difference in the minute structure of the corallum in these two genera, Mr. Hickson remarks that "it is difficult to see why this difference should be considered of any great morphological importance. The size of the pores or 'tubuli,' as Prof. Nicholson calls them, varies considerably in the different regions of the corallite, being at the younger ends much larger than they are at the older ends, so that it is evident that as the corallite grows older the tubuli have a tendency to be filled up, and a still further continuation of this process would make the wall of the corallite quite aporous. I have no evidence to prove that the complete filling-up of these perforations in the walls ever does occur in *Tubipora*; but should an example be found in which this has occurred, I should certainly not consider it sufficient reason for the formation of a new genus or even a new species. That the skeleton of *Syringopora* 'shows no signs of being formed by the fusion of ectodermal spicules' is not to be wondered at, as we possess no means of studying either the development or the growth of the skeleton of this form, since the delicate growing ends would be broken down and destroyed; and even in recent genera (such as *Corallium*, Lacaze-Duthiers), in which the skeleton is known by an

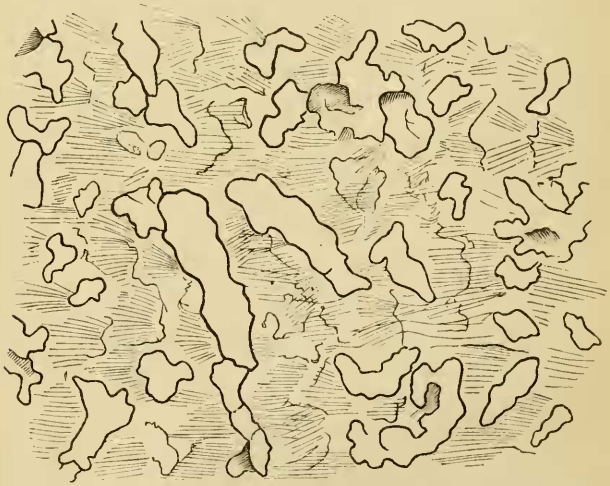
examination of its growth to be composed of fused spicules, no evidence of them can be seen in thin transverse section through the hard parts."

With regard to Mr. Hickson's statement that it is "difficult to see" why the difference between the spicular skeleton of *Tubipora* and the compact skeleton of *Syringopora* "should be considered to be of any great morphological importance," I can merely say that this is clearly a matter of opinion. For my own part I find it difficult to see why this distinction as to the minute structure of the corallum should *not* be considered as of great morphological importance; and some investigations that I have recently been carrying out have very much confirmed me in this opinion. The hypothesis, on the other hand, that possibly an aporous form of *Tubipora* may be in future discovered, would not lead me to disregard the known structure of the actual form of *Tubipora*. Moreover it is not only that the skeleton of *Syringopora* does not show "signs of being formed by the fusion of ectodermal spicules," but that it does show signs of having a structure very similar to that of various undoubted recent Zoantharians, and quite unlike that of any known recent Alcyonarian. Again, it is not the case that "we possess no means of studying either the development or the growth of the skeleton" of *Syringopora*, "since the delicate growing ends would be broken down and destroyed." On the contrary, as regards the growth of the skeleton, any good collection of Palæozoic corals contains perfect colonies of *Syringopora*, in which the growing extremities of the tubes are as well preserved as we have any ground for supposing that they would be were the coral a recent one; and an examination of these growing ends shows that they do not differ in minute structure from what is found in the older parts of the tubes.

Lastly, as regards the structure of the skeleton in *Corallium*, Mr. Hickson has fallen into error, and his argument, in reality, points in the opposite direction. He argues, namely, as I understand him, that *Syringopora* may have really had a spicular skeleton, because in the recent genus *Corallium*, though we know from an examination of its growth that the skeleton is really composed of fused spicules, "no evidence of them can be seen in thin transverse section through the hard parts." As a matter of fact, however, such spicules were shown to exist in sections of the skeleton of *Corallium* by Lacaze-Duthiers, and were both described and figured by Kölliker ('Die Bindesubstanz der Cœlenteraten,' p. 146, Taf. xvi. fig. 9). It is not necessary, however, to quote authorities on such a point, as I have never had any difficulty in demon-

strating the presence of the component spicules in any thin section of the skeleton of *Corallium* that I have prepared. The annexed sketch of part of a longitudinal section of a branch of *Corallium* will show that the skeleton is made up of spicules of the ordinary type of these structures amongst the Alcyonarians, the outline of the spicules being sometimes indistinct, and the interspaces between them being occupied by a peculiar crystalline tissue. Essentially similar phenomena are seen in transverse sections of the skeleton of *Corallium*. I may add that I have also always found it possible to recognize the presence of the component spicules of the corallum even in the genus *Isis*, though the fusion of the spicules is here much more complete than it is in *Corallium*. In fact, the spicules in *Corallium* are not, strictly speaking, "fused," any more than they are in *Tubipora*.

Fig. 1.

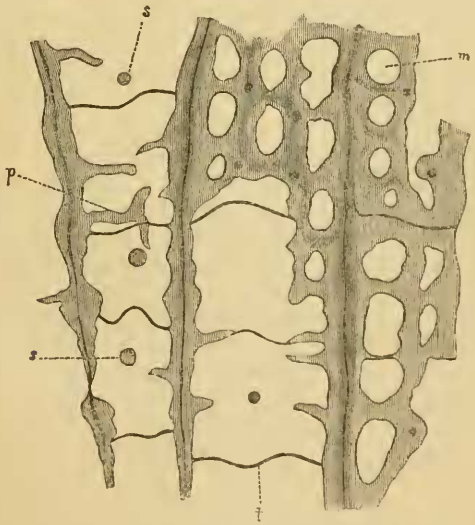


Part of a longitudinal section of *Corallium rubrum*, magnified 180 times, showing the spicules of the skeleton united by a crystalline or fibrous matrix, produced by the calcification of the soft interspicular tissues.

In the second place, Mr. Hickson has made a series of very interesting investigations as to the endothecal structures of *Tubipora*, in which he shows that there is a much closer apparent resemblance between the axial tube of this genus and the infundibuliform tabulæ of *Syringopora* than I had been led to believe was the case by examining the specimens of the former genus at my disposal. He also shows that flat tabulæ, sometimes complete and sometimes incomplete, are

present in *Tubipora*. These latter structures, which are evidently very variable, I have not succeeded in detecting, but I do not doubt their existence. I cannot, however, admit that the presence of flat tabulæ in *Tubipora* affords any strong argument for concluding that this genus is nearly related either to *Syringopora* or to any of the Favositidæ. Nor, indeed, can I admit that tabulæ, in themselves, are any guide whatever to the zoological position of any calcareous skeleton, whether recent or extinct, since these structures are known to occur in Zoantharians (*Pocillopora* &c.), Alcyonarians (*Heliopora*), Hydrozoa (*Millepora*), and Polyzoa (*Heteropora*). I cannot, further, allow Mr. Hickson's statement (*loc. cit.* p. 21), that "tabulæ are quite unknown amongst the Poritidæ," to pass without pointing out that, in making it, he has fallen into error. Thus Dana, long ago, showed that "tabulæ," essentially similar to the tabulæ of *Favosites*, occur in the genus *Alveopora*, and figures of these were given by this dis-

Fig. 2.



Part of a longitudinal section of the corallites of *Porites clavaria*, Lam. (Recent), enlarged eleven times. *t*, tabula; *s s*, septal spines, cut across near their bases; *p*, septal spine, projecting into the visceral chamber; *m*, mural pore.

tinguished observer in support of his statement. It is, moreover, easy to demonstrate by means of thin sections that "tabulæ," in all essential points quite like those of the Favo-

sitidæ, occur in species of the genus *Porites* itself. Thus, I find them to be well developed in *Porites clavaria*, Lam., and to be even more numerously developed in *Porites astræoides*, Lam. I annex a sketch of a thin longitudinal section of some of the corallites of *Porites clavaria*, to show the tabulæ (fig. 2). As I purpose, however, to return to this subject at greater length, I shall say nothing further about it here, merely adding that a comparison between the accompanying section of *Porites clavaria*, Lam., and a corresponding section of such a species of *Favosites* as *F. hemisphærica*, Yand. & Shum., will show how striking is the structural agreement between the two.

Finally, as regards the existence of septa, Mr. Hickson has described in *Tubipora* certain septiform structures which he finds occasionally to unite the axial tube to the theca; and he also mentions that "occasionally individual spicules will project out radially into the cavity of the corallite in a manner exactly similar to the so-called 'septa' of *Syringopora*." I regret that I cannot accept either of these structures (both of which I have seen) as being at all of the nature of true septal spines, or as being in any way properly comparable with the vertically arranged spiniform septa of *Syringopora*. The septal spines of *Syringopora* are, on the other hand, properly comparable, in my opinion, with the septal spines of such Zoantharians as *Porites* and *Alveopora*.

I need hardly add, finally, that I find myself compelled to dissent entirely from Mr. Hickson's conclusion, that "the evidence at our command tends to prove that the Favositidæ are really Alcyonarians, and that *Syringopora* is also an Alcyonarian allied to *Tubipora*." On the contrary, I think the evidence at our command is sufficient to prove that the Favositidæ are Zoantharians closely allied to the Poritidæ, and that *Syringopora*, instead of being an Alcyonarian and allied to *Tubipora*, is a Zoantharian and allied to *Favosites*. On this last point I hope shortly to publish some interesting additional evidence that I have recently obtained.

III.—*On the* Mantis metallica *of Westwood.*

By J. Wood-Mason.

The beautiful species of the Orthopterous family Mantodea, which was described and figured nearly forty years ago by Prof. Westwood in his 'Arcana Entomologica,' under the name of *Mantis metallica*, would appear still to be unique, or at